ecliptic, and as great circles intersect in opposite points, E will be 180° less than A, or 106° 14′ 45″, and 180° + PI=223° 10′ 36″, the longitude of the point passing the meridian.

The senseless divinations of Astrology, are almost entirely based upon finding the three points of the ecliptic required in this problem, for the moment of birth, at a given place.

Also solved by *EDMUND FISH*, Hillsboro, Ill.

48. Proposed by F. P. MATZ, D. Sc., Ph. D., Professor of Mathematics and Astronomy in Irving College, Mechanicsburg, Penn.

In case of *mischance*, with what force would the cow, weighing m=700 pounds, jumping over the moon, have struck Her Lunar Majesty in the face?

Solution by G. B. M. ZERR, A. M., Ph. D., President and Professor of Mathematics, Russell College, Lebanon, Va.

Let m=mass of cow on moon, $g'=\frac{1}{6}g$=gravity on moon, r=2163 miles=radius of moon, a=238840 miles=distance from earth to moon, A=momentum $=mv$, E=kinetic energy$=\frac{1}{2}mv^2$.

Then $v^2=2g'r\left(\frac{a-r}{a}\right)$, $m=\frac{700}{6g'}$.

$$\therefore\ A=\tfrac{700}{6}\sqrt{\frac{2r}{ag'}(a-r)}=\tfrac{700}{3}\sqrt{\frac{3r}{ag}(a-r)},$$

$$=\tfrac{700}{3}\sqrt{\frac{6489\times 5280\times 236677}{238840\times 32.2}}=239595.79 \text{ foot-pounds.}$$

$E=(350r/3a)(a-r)=1320341350.762$ foot-pounds.

The value of A is the force required.

PROBLEMS FOR SOLUTION.

ARITHMETIC.

83. Proposed by the late REV. G. W. BATES, A. M., Pastor of M. E. Church, Dresden City, Ohio.

A has three notes; the first and second, $1000 each, and the third $457; all dated April 1, 1884. The first is due April 1, 1888, second, April 1, 1889, and the third, April 1, 1890, and each bearing interest at 6%. What must B pay for the three notes September 21, 1886 that the investment will bring him 8% compound interest?

[NOTE—The above problem was the result of an actual business transaction.]

84. Proposed by SYLVESTER ROBBINS, North Branch Depot, N. J.

Show how to find sides, integral, fractional, and irrational for twenty-four triangles, each one containing 330 square yards.

85. Proposed by E. W. MORRELL, A. M., Professor of Mathematics, Montpelier Seminary, Montpelier, Vt.

In turning a one-horse chaise within a ring of a certain diameter, it was observed that the outer wheel made two turns, while the inner wheel made but one. The wheels were each 4 feet high; and supposing them fixed at the distance of 5 feet on the axletree, what was the circumference of the track described by the outer wheel? From *Greenleaf's National Arithmetic.*

86. Proposed by EDGAR H. JOHNSON, Professor of Mathematics, Emroy College. Oxford, Ga.

$\frac{1}{7}=.\dot{1}42857\dot{1}$; $\frac{1}{11}=.\dot{0}\dot{9}$; $\frac{1}{13}=.\dot{0}76923\dot{0}$; $\frac{1}{17}=.0588235294117647\dot{0}$.

Observe that if the numbers forming the first half of the repetend be added respectively to the numbers forming the second half of the repetend, the sum is in every case 9. What is the general law of which these are special cases?

GEOMETRY.

80. Proposed by J. C. GREGG, Superintendent of Schools, Brazil, Ind.

One circle touches another internally, and a third circle whose radius is a mean proportional between their radii passes through the point of contact. Prove that the other intersections of the third circle with the first two are in a line parallel to the common tangent of the first two. [From *Phillips and Fisher's Geometry.*]

81. Proposed by CHAS. C. CROSS, Laytonsville, Md.

A circle is drawn bisecting the lines joining the points of contact of the inscribed circles with the sides produced. Another circle is drawn passing through the centers of the circles drawn tangent externally to the in-circle and internally to the sides of the triangle. Prove that the centers of these two circles, the incenter and the circumcenter are collinear.

82. Proposed by WILLIAM SYMMONDS, A. M., Professor of Mathematics and Atronomy, Pacific College, Santa Rosa, Cal.

If the extremities of the base of a triangle be joined by straight lines to the exterior angles of squares constructed upon its two sides, the superior pair of lines thus drawn intersect at right angles; the inferior pair intersect at a point in a line drawn from the vertical angle perpendicular to the base.

MECHANICS.

58. Proposed by ALFRED HUME, C. E., D. Sc., Professor of Mathematics, University of Mississippi, University, Miss.

An endless uniform chain is hung over two small smooth pegs in the same horizontal line. Show that, when it is in a position of equilibrium, the ratio of the distance between the vertices of the two catenaries to half the length of the chain is the tangent of half the angle of inclination of the portions near the pegs. [From *Ruth's Analytical Statics. Mathematical Trifos, 1855.*]

59. Proposed by WILLIAM HOOVER, A. M., Ph. D., Professor of Mathematics and Astronomy in Ohio State University, Athens, Ohio.

Find the radius of sphere of given specific gravity which will rest just immersed in a fluid whose density varies as its depth.

60. Proposed by J. SCHEFFER, A. M., Hagerstown, Md.

What must be the ratio of the two legs of a uniform and heavy right triangle suspended from the center of the inscribed circle, if this triangle will rest with the shorter leg in a horizontal position?